U. S. FOREST SERVICE

RESEARCH NOTE NC-4

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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Minnesota's Aspen and Its Projected Supply

Aspen, Minnesota's largest forest type,[1] covers nearly one-third of the commercial forest land in the State. Its major components are bigtooth aspen, *Populus grandidentata,* and quaking aspen, *P. tremuloides,* both fast-growing, generally short-lived, aggressive pioneer species that readily become established in burns and clear cuttings. They cannot be "stored on the stump," as they become decadent rapidly after reaching maturity. Their wood is technically identical.

The Present Stand

Based on the most recent Minnesota Forest Survey estimates (1962), the 5,451,000 acres of commercial forest land in the aspen type are distributed by size, age, and site classes as shown in table 1. Poletimber, the dominant size class, comprises almost three-fourths of the type. More than one-half of the type is in stands 30 to 50 years old—rapidly approaching maturity. Sites of three-fourths of the land supporting aspen are classed as medium and better (site index 56+).

The table also shows the distribution by the relatively new concept of area condition class. Under this concept, commercial forest land is classified according to the amount of growing space occupied by desirable trees compared to the area not occupied by desirable trees. The amount of growing space not occupied by desirable trees is further classified according to the potential difficulty in establishing desirable trees. Thus, an area without a desirable tree but without a serious inhibiting factor is rated higher than one in which undesirable factors, such as brush or cull trees, reduce the opportunity of obtaining desirable stocking on that area.

Almost half of the type is in area condition classes 1 and 2—at least 40-percent stocked

Table 1.—Area of aspen type on commercial forest land, Minnesota, 1962

Item	Thousand acres	Percent of total
Stand-size class:		
Sawtimber	293	5.4
Poletimber	3,833	70.3
Sapling and seedling	1,325	24.3
Stand age class (years):		
Less than 9	321	5.9
10 - 19	559	10.3
20 - 29	1,005	18.4
30 - 39	1,642	30.1
40 - 49	1,202	22.1
50 - 59	409	7.5
60 - 79	260	4.8
80 - 99	52	.9
100 - 119	1	<.1
Site class:		
Excellent (SI 76+)	650	11.9
Good (SI 66-75)	1,591	29.2
Medium (SI 56-65)	1,874	34.4
Poor (SI 45-55)	1,336	24.5
Area condition class:		
1- Desirable	1,310	24.0
2- Moderate and favorable	1,226	22.5
3- Moderate and unfavorable	898	16.5
4- Poor but favorable	690	12.7
5- Poor and unfavorable	1,327	24.3

[1] *See end of Note for definitions of terms used here.*

with desirable trees *and* with conditions favorable for a potentially denser desirable stocking. More than 2 million acres (37 percent) are less than 40-percent stocked with desirable trees—about two-thirds of this having conditions unfavorable for natural regeneration.

Eighty-six percent of the growing-stock volume of 38 million cords is in trees less than 11 inches d.b.h.—that is, in pole-sized trees (table 2). More than half of the sawtimber volume is in trees in the 12-inch d.b.h. class.

Table 2.—Volume of aspen growing stock and sawtimber on commercial forest land by diameter class, Minnesota, 1962, and totals from the 1953 Survey

D.b.h. class (inches)	Growing stock		Sawtimber	
	Thousand cords	Percent of total	Million board feet	Percent of total
6	12,706	33.2	-	-
8	12,363	32.4	-	-
10	7,659	20.0	-	-
12	3,110	8.1	1,315	55.1
14	1,524	4.0	680	28.5
16	554	1.5	273	11.4
18	179	.5	70	2.9
19.0+	110	.3	50	2.1
Total	38,205	100.0	2,388	100.0
1953 totals	22,937		1,716	

Between 1953 and 1962, Minnesota's aspen increased 67 percent in growing-stock volume and 39 percent in sawtimber volume (table 2). In 1962, the growing-stock volume of aspen comprised 31 percent of the total for all species compared to 25 percent in 1953. Aspen sawtimber volume increased from 14 percent in 1953 to about 15½ percent of the total for all species in 1962.

The Future Stand

Two important questions arise concerning the future of aspen. What will the resource be in 10 or 20 years? Could heavier cutting be sustained without depleting the growing stock?

To answer these questions, three resource projections were prepared, each controlled by a different timber cut (*A, B, C*) for the selected output years of 1970 and 1980. Starting with the number of trees by 2-inch d.b.h. classes for the beginning of 1962 (year of survey), and adding the net inventory change (net change is obtained by subtracting timber cut, mortality, and the growth on cut and mortality from the expected gross growth) during each year, an updated or projected stand was obtained for the specified output years; the numbers of trees were then converted to volume.

The three timber cut estimates (*A, B, C*) for 1970 and 1980 came from two sources. The estimate *A* is based on historical trends and is the most conservative of the three. The other two came from *Timber Trends in the United States.*[2] *B* is based on the estimated cut of hardwood growing stock in the North,[3] while *C* is based on the estimated hardwood-roundwood-pulpwood production in the United States. The estimated aspen timber cuts for 1970 and 1980 (projection controls) compared to the 1962 actual cut of 549,000 cords are:

	Control		
	A	*B*	*C*
1970			
Estimated cut, thousand cords	607	747	813
Percent of 1962 cut	110	136	148
1980			
Estimated cut, thousand cords	689	1,000	1,258
Percent of 1962 cut	125	182	229

Under all three cutting levels, the volumes of standing timber show increases for both 1970 and 1980 (table 3). These increases,

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[2] *U.S. Forest Service. Timber Trends in the United States. U.S. Forest Serv. Forest Resource Rep. 17, 235 pp., illus. 1965.*

[3] *North region comprises 26 States from a line between the southern borders of Virginia and Kansas north to the Canadian border—the northeast quarter of the Nation.*

Table 3.—Minnesota aspen; projected volume of growing-stock trees in 1970 and 1980 for three timber cut controls[1]
(In million cords)

Diameter class (inches)	1962	1970			1980		
		A	B	C	A	B	C
6	12.7	11.9	11.8	11.9	10.0	9.9	9.9
8	12.3	17.8	17.8	17.7	20.5	20.3	20.1
10	7.7	13.3	13.2	13.2	21.3	20.8	20.5
12	3.1	5.6	5.4	5.4	11.4	10.6	10.0
14	1.5	2.0	1.9	1.8	4.4	3.5	3.1
16	.6	.7	.7	.6	1.4	1.1	.9
18	.2	.3	.3	.3	.7	.5	.4
20	.1	.1	.1	.1	.3	.2	.2
22+	.0	.1	.1	.1	.1	.1	.1
Total	38.2	51.8	51.3	51.1	70.1	67.0	65.2

[1] Timber cut controls for projections A, B, and C are described in the text.

then, lead to the answers to the two questions about the future of aspen. Apparently, the present resource can sustain a heavier cutting and at the same time increase in volume.

For the three projections, some significant changes in volume distribution by size class can be noted (table 3). Large numbers of trees (volume) are moving into larger diameters. These stands originated in a relatively short period after the extensive cutting and burning of about 50 years ago. As the stands mature and trees continue to move into larger diameters, the average tree will become bigger in both height and diameter; therefore, the volume per acre will be greater. Harvesting should then be more efficient, and one of aspen's marketing problems—its use limitations due to small size—will be at least partially alleviated.

As might be expected with a relatively short-lived species like aspen, the projections show no significant increases in the number of larger trees (16 inches d.b.h. and over). Similarly, with a rapidly growing, early maturing resource the proportion of the total volume in small trees (6 inches d.b.h. and under) declines as the resource ages.

What does this mean to wood-using industries depending upon aspen for their major source of raw material? Substantially larger harvests of aspen could probably be made from the Minnesota aspen resource over the next several decades. However, because of the inherent biological characteristics of the species, the bulk of the resource will be in pole-size or, at best, small sawtimber-size trees (8 to 12 inches d.b.h.). Thus, this resource will afford opportunities for those products that can be manufactured from these size classes. The necessity for efficiencies in logging, transporting, and manufacturing relatively small-size materials will continue.

The projected growth of our national economy is sharply upward. The factors used to measure this growth—population, new household formation, gross national product, disposable personal income, and construction activity—also influence consumption of forest products. Forest industry planners seeking additional sources of timber supply to meet increasing demand for forest products should consider Minnesota aspen — an available resource.

Definitions of Terms

Aspen type.—A stand in which a mixture of quaking or bigtooth aspen, balsam poplar (balm-of-Gilead), and paper birch predominate, with the aspen the most common.

Commercial forest land.—Forest land which is producing or capable of producing crops of industrial wood and not withdrawn from timber utilization.

Sawtimber stands.—Stands at least 10 percent stocked with growing-stock trees and with a plurality of stocking by live sawtimber trees (at least 11.0 inches d.b.h.).

Poletimber stands.—Stands at least 10 percent stocked with growing-stock trees with a plurality of stocking by poletimber trees (5.0 to 10.9 inches d.b.h.).

Sapling and seedling stands.—Stands at least 10 percent stocked with growing-stock trees and with a plurality of stocking by saplings and seedlings (less than 5.0 inches d.b.h.).

Site classes.—These classifications are used to measure quality of forest land for raising timber products. Site index (SI) is the expected height of a free-growing tree at age 50.

Area condition class.—

1—Areas 70 percent or more stocked with desirable trees.

2—Areas 40-70 percent stocked with desirable trees and with less than 30 percent of area controlled by inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

3—Areas 40-70 percent stocked with desirable trees and with more than 30 percent of the area controlled by inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

4—Areas less than 40 percent stocked with desirable trees and with adequate seed source and seed bed favorable to natural restocking.

5—Areas less than 40 percent stocked with desirable trees and with inadequate seed source and/or seed bed unfavorable to natural regeneration.

Growing-stock volume.—Net volume of live merchantable sawtimber and poletimber trees from the stump to a variable 4-inch top diameter outside bark of the central stem. Does not include limbs or cull-tree volume. (There are 79 cubic feet of solid wood in a standard cord.)

Sawtimber volume.—Net volume, International ¼-inch rule, of live merchantable sawtimber trees (11.0 inches d.b.h. and larger) from the stump to a point in the central stem at which utilization for sawn products is limited by large branches, forks, or other defects, or by a diameter outside bark of 8.0 inches.

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